GOLF CLUB SET WITH VARIABLE THICKNESS AND/OR DENSITY FACE INSERTS

This application claims the benefit of U.S. provisional application No. 60/356,802 filed on February 14, 2002.

BACKGROUND OF THE INVENTION

The mechanical properties or characteristics of a golf club include the center of gravity and moment of inertia. These properties influence the performance of the club and the resulting flight of a struck golf ball. For example, a lower center of gravity creates a higher trajectory than a comparable club with a higher center of gravity. In addition, a club having a more rearward center of gravity is more forgiving when balls are struck outside the center or sweet spot of the striking face. A physical measure of the forgiveness of a club head is its moment of inertia.

The present invention relates to a set of golf clubs having variable thickness and/or density face inserts to alter the mechanical properties of the clubs throughout the set.

BRIEF DESCRIPTION OF THE PRIOR ART

Iron-type golf clubs with face inserts are well known in the patented prior art. The Mahaffey et al. patents No. 5,766,094, 5,827,131 and 6,074,309, for example, disclose golf club heads with laminated striking face inserts which contain cavities and/or laminations so that the inserts have a reduced weight relative to prior inserts, whereby more weight can be shifted to the perimeter of the clubs.

While the prior golf clubs with striking face inserts operate satisfactorily, they do not have any effect on the center of gravity of the clubs within a set since all of the inserts have the same characteristics. It is known in the art, however, to add weights to the sole or back portion of a club head to alter its center of gravity. This increases the manufacturing cost of the head however and is difficult to correlate throughout a set of clubs.

The present invention was developed in order to overcome these and other drawbacks of the prior art by providing a set of golf club heads with variable face inserts to enhance the mechanical properties of the club heads.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the invention to provide a set of golf clubs having heads of progressively increasing loft throughout the set. Each of the heads includes a body having top, bottom, toe and heel portions and a striking face area containing a recess. An insert is secured within the recess and the thickness and/or density of the inserts increases within the set of clubs as the loft of a club increases. This results in a lower center of gravity for the long irons and a higher center of gravity for the short irons to improve the trajectory of a golf ball when struck by the clubs.

According to a further object of the invention, the insert and the body of each club are formed of different materials. Moreover, the inserts in the clubs within a set of clubs may also be formed of different materials to alter the density of the inserts throughout the set.

According to another embodiment of the invention, the thickness and/or density of an insert is varied from the bottom of the insert to the top of the insert. In addition, the materials used in an insert may also differ from the bottom portion to the top portion thereof to change the weight distribution within the insert.

BRIEF DESCRIPTION OF THE FIGURES

Other objects and advantages of the invention will become apparent from a study of the following specification when viewed in the light of the accompanying drawing, in which:

Fig. 1 is an end view of a long iron of a set of golf clubs according to the invention;

Fig. 2 is an exploded front perspective view of the iron of Fig. 1;

Fig. 3 is an end view of a mid-iron of a set of golf clubs according to the invention;

Fig. 4 is an exploded front perspective view of the iron of Fig. 3;

Fig. 5 is an end view of a short iron of a set of golf clubs according to the invention;

Fig. 6 is an exploded front perspective view of the iron of Fig. 5;

Figs. 7 and 8 are end views of differently tapered inserts, respectively, for a golf club head according to the invention; and

Fig. 9 is a perspective view of an insert formed of different materials according to the invention.

DETAILED DESCRIPTION

A set of golf club irons includes long, mid, and short irons. Typically, and for purposes of the invention, the long irons comprise irons numbered 1, 2, 3 and 4 which have lofts ranging from approximately 16° for a 1-iron to 24° for a 4-iron. The mid-irons include irons numbered 5, 6, 7 and 8 and have lofts from 26° for a 5-iron to 38° for an 8-iron. The short irons include a 9-iron, pitching wedge, sand wedge and one or more lob wedges having lofts from 42° for a 9-iron to 60° for a lob wedge.

Figs. 1 and 2 show a long iron 2 (i.e., a 1, 2, 3, or 4 iron) according to the invention. The iron includes a body 4 having top 6, bottom 8, toe 10 and heel 12 portions and a striking face area containing a recess 14. The body is made of any suitable material such as forged carbon steel, investment cast stainless steel, or hardened polymer or synthetic plastic material. Around the perimeter of the recess is a ledge 16 against which an insert 20 rests when the insert is secured within the recess. The insert may be secured to the body by any suitable means such as welding or crimping so that the striking face 22 of the insert is substantially flush with a non-recessed portion of the striking face area of the body.

The insert 22 has a thickness t_1 from front to back which is uniform throughout the insert. The thickness is between 0.09 and 0.14 inch, and preferably

0.11 inch. The insert may be formed of the same material as the body or of a lighter weight hard metal such as titanium or a fiber reinforced plastic material (FRP).

In Figs. 3 and 4 are shown a mid-iron golf club 102 (i.e., a 5, 6, 7, or 8 iron) including a body 104 and an insert 120. The structure of the club 102 is similar to the club 2 of Figs. 1 and 2 but for the difference in loft of the club and a different thickness t_2 for the insert. More particularly, the thickness t_2 is greater than the thickness t_1 and is between 0.13 and 0.18 inch.

In Figs. 5 and 6 are shown a short iron golf club 202 (i.e., a 9 iron, pitching wedge, sand wedge or lob wedge) including a body 204 and an insert 220. The structure of the club 202 is similar to the clubs 2 and 102 but for the difference in loft of the club and a different thickness t_3 for the insert. The thickness t_3 is greater than the thickness t_2 and is between 0.19 and 0.21 inch.

Varying the thickness of the inserts, either on a club by club basis, or between groups of clubs as identified above, will allow the center of gravity of the club head to be relatively lower and more rearward from the striking face in the long irons compared to the short irons. This is because the thinner inserts in the long irons are lighter than the thicker inserts in the short irons. A lower center of gravity in the long irons increases the flight trajectory of a struck golf ball. Conversely, a higher center of gravity in the short irons decreases the flight trajectory of a struck golf ball.

The distance of the center of gravity of a club head from the striking face of the insert affects the moment of inertia of the head. The moment of inertia is taken around the axis of the head. In the long irons, where the center of gravity is farther from the striking face, the moment of inertia is greater and the club is more forgiving. In the short irons, where the center of gravity is nearer to the striking face, the moment of inertia is less and the club head is less forgiving and more workable in executing a golf shot.

In addition to thickness, another element which affects the weight of an insert and thus the position of the center of gravity of the insert is the density of the material from which the insert is formed. Club heads for long irons preferably have inserts formed of less dense materials such as titanium for lower weight and a higher,

more rearward center of gravity, whereas club heads for short irons preferably have inserts formed of more dense materials such as 1030 carbon steel for a lower more forward center of gravity. Mid-irons have inserts formed of strong steel such as 17-4 or carpenter alloys.

While inserts may be made with a variable thickness or a variable density, they may also be made with a combination of the two in order to customize the performance of the clubs in a set. Any combination may be used throughout the set, either within groups of clubs (i.e., long, mid and short irons) or within individual clubs. The same applies to different materials for the inserts. They can be the same or varied throughout the set of clubs depending on the desired performance.

Since the inserts can be tailored in thickness, density, and/or material to the desired weight to reposition the center of gravity, it is not necessary to supplement the club head with additional weights in the sole or other regions of the club head body. Avoiding additional weighting reduces the cost of manufacture and provides consistent performance. However, weights can be used, such as by custom club fitters, in order to satisfy the needs of a particular player.

Referring now to Fig. 7, an alternate embodiment for an insert 320 is shown. In this insert, the thickness progressively increases from the bottom to the top of the insert. That is, the bottom thickness t_4 is less than the top thickness t_5. Such a configuration raises the center of gravity. Conversely, an insert 420 which is thicker at the bottom than at the top such as shown in Fig. 8 would lower the center of gravity.

A further embodiment of a club head insert 520 is shown in Fig. 9. This insert is formed of different materials having different densities in order to adjust the center of gravity of the head in which the insert is used. The embodiment illustrated comprises three materials 540, 542, and 544, although any number may be provided. In a preferred embodiment, the lower material 540 is heavier steel, the upper material 544 is lighter titanium, and the middle material 542 comprises a transition area with a density between titanium and steel. This insert is characterized by more weight at the bottom for a lower center of gravity of the club head, i.e., for use in long irons.

Alternatively, by reversing the materials, an insert with more weight toward the top is provided for a higher center of gravity of the club head, i.e., for short irons.

While the preferred forms and embodiments of the invention have been illustrated and described, it will be apparent to those of ordinary skill in the art that various changes and modifications may be made without deviating from the inventive concepts set forth above.